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STATE OF WASHINGTON

DEPARTMENT OF ECOLOGY

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October 3, 1996

Ms. Donna Wanek
U.S. Department of Energy
P.O. Box 550, MSIN: H4-83
Richland, WA 99352

Dear Ms. Wanek:

Re: Comments on Draft A of the Resource Conservation and Recovery Act (RCRA) Corrective Measure Study for the 200-PO-1 Operable Unit (DOE/RL-96-66) - 44958

The Washington State Department of Ecology (Ecology) has completed its review of the RCRA Corrective Measure Study for 200-PO-1 Operable Unit. The following review comments include comments from both Ecology and the Environment Protection Agency (EPA). Comments identified as a result of the review are enclosed for response to the comments.

The document is written in accordance to methodology and submitted in compliance to Milestone M-15-25A. However, there remain several problem areas, such as, no monitoring of high concentration and no protection monitoring provided for 400 Area supply well and the supply wells located in Richland. Lastly, incorporation of the **approved** site-wide groundwater modeling into 200-PO-1 is essential for future decision making. Also, keep in mind, Ecology has not endorsed the Hanford Sitewide Groundwater Remediation Strategy-Groundwater Contaminant Predictions (BHI-00469, Rev.0).

Since the *CMS Report* is a primary document, Ecology looks forward to resolving our comments within the Tri-Party Agreement time frames. If you have any questions or concerns, please contact me at (509) 736-3024.

Sincerely,

Zelma Maine-Jackson

Zelma Maine-Jackson, Hydrogeologist
Nuclear Waste Program

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ZMJ:sb
Enclosure

cc: Mary Furman, USDOE   Mary Lou Blazek, ODOE

The Washington State Department of Ecology's (Ecology) Comments on Draft A of the Resource Conservation and Recovery Act (RCRA) Corrective Measure Study for the 200-PO-1 Operable Unit (DOE/RL-96-66

Page l-l, first para.: Replace "in lieu of an RFI/CMS work plan" with "without RFI/CMS work plan or additional field work" because EPA, Ecology, and USDOE agreed that sufficient information already existed from other programs.

Page 1-1, first para., line 10: Add the Tritium document reference here.

Page 1-1, end of first para.: This CMS looks at final, not interim actions, and in addition, the source operable units may have other remedial actions.

Page 1-1, para. 2, last sentence: Explain and reference the idea that a ROD will document the 200 Area NPL site; explain the relationship to RPP units, etc.

Page 2-2: Add a section title "2.3.4 Other Contaminants."

Section 3: It is important to consider issues in the development and use of models. This CMS relies and extrapolates much of its content from the *Groundwater Remediation Strategy-Groundwater Contaminant Predictions* (BHI-000469). There are many problems relating to the use of models in review of Superfund cleanup process, such as:

- Decisions concerning when to use a model and which code to use (which is left to the discretion of the contractor).
- Models do not account for all the processes affecting the fate and impact of the contaminants.
- Models lack accuracy when confronted with a high degree of heterogeneity (e.g., complex hydrogeology, multiple contaminants, two-phase flow and variable susceptibility in populations) and a long list of other components, some of which this model exemplifies. Although the basic problem is not a lack of appropriate documents to guide the modeling process, but a lack of training and experience in the people who are choosing and using models, deficiencies, or limitations in the codes themselves, and scientific barriers that determine to what extent models are able to incorporate relevant processes. Where in the document or references is the quality assurance plan?

Page 3-1: This groundwater model is not an approved model to be used at the Hanford Site. In addition, the model has not been reviewed by Ecology.

Page 3-1, Second to last sentence: Please add some words to the document stating that Ecology, as a participant in the 200-PO-1 DQO, want to participate in the model conceptual design through calibration phases. Ecology was not given this opportunity.

Page 3-2, first full para.: Explain how a simplified numerical conceptualization led to more credible results. This is stated as a fact, when it is really more of an opinion. Documentation needs to be provided to support this statement.

Page 3-2, Section 3.1.1: No justification or appropriate references are provided for two key assumptions which include, area of recharge from the surface due to precipitation (and related vadose contribution of contaminant to the groundwater) and communication between the unconfined and confined aquifers being negligible. It is Ecology's opinion that the recharge from the surface can be significant in specific places, and that overall across the site, over a period of 200 years, it is an important component to the dynamics of the groundwater regime. This is supported by multiple PNNL recharge documents and papers by Gee. Also, see new information on recharge associated with the tank farms. This would indicate that the associated vadose zone contribution of contaminants to the groundwater is significant over the period of 200 years. See various Performance Assessments that are being performed in 200 Area which could potentially impact the groundwater in less than 130 years.

Page 3-4, para. 3: The model is technically flowed because it assumes no recharge from precipitation (see above discussion). Also, in the Kennewick and Richland areas, studies have indicated that significant recharge also comes from precipitation on the basalt hills and subsequent runoff onto sedimentary units of the Ringold and Hanford Formations.

Page 3-4, para. 3, last sentence: The statement about "groundwater data not revealing any significant contribution. . ." is incorrect and not valid. In fact, sufficient data has been found in three tank forms in the East and West Areas to warrant the tanks going into RCRA groundwater assessment. SX Tank Farms has impacted the groundwater with technetium, chromium, and potentially cesium. The plume related to the technetium can be detected in many groundwater wells. In addition, Gee has done significant work that demonstrates the volume of water which recharges below a tank farm can be significantly increased due to the shadow/funnel effects created by the tanks themselves and the coarse, gravel, non-vegetated surface of the tank farms. The text should be corrected and include up-to-date information.

Page 3-4, Section 3.1.2: The calibration process is an exercise in "trial and error" where a set of model parameters are proposed, computed, and measured values of head are compared and model paramenters are adjusted to improve the fit. The results are used as a "quasi-independent" check on the model parameters arrived by the calibration. What were the steps in the model verification?

Page 3-5: The modeling effort did not include the information about vadose zone contribution of tritium. As documented from the **ETF?**

Page 3-5, para. 3: Due to the extensive 14 year data base, was an alternative approach to calibration considered, such as, to solve the "inverse problem"?

Page 3-7: The impacts due to increased farming in upgradient areas is not analyzed with this model. Other site models utilize recharge in these areas.

Section 3: None of the other site models agree with the data generated from this modeling effort. This causes significant validation problems for this modeling effort. In addition, why spend significant money adopting a totally new site model instead of adapting the site wide modeling performed by PPNL? Why not at least utilize the detailed hydraulic layering information and boundary conditions provided in PNNL's site wide model?

How is the model impacted by the groundwater divide that is created by the river to groundwater pumping in the Richland well field? How did you predict that the pumping will continue for 200 years? What does the analysis show if the pumping is stopped and the groundwater divide shifts? Do the presently contained plumes then move into the Richland area?

Tables 3-l, through 3-3: Provide the dispersivity used and the justification and references for dispersivity used.

Page 4-2. para. l, line 3: The information from the DQO on the hierarchy is misrepresented. Please review DQO notes and correct.

Page 4-2. Section 4-3, bullet l: What about MTCA standards for arsenic?

Section 5: Significant information is missing from this section as follows:

- There is no Limited Ecological Risk Assessment provided as discussed in many meetings.
- The potential risk to the 400 Area water supply is not discussed.
- Potential contaminants impacts and associated risk to the Richland wells is not identified.
- The impact of the Richland well field induced groundwater divide is not discussed. What are the risks if the well field divide shifts during the next 200 years?

Although this risk evaluation is qualified as a screening analysis, it should also include some cursory assessment of ecological receptors. It is important to consider ecological risks, as well as human risks, since there are cases in which contaminants are likely to present significant risks to ecological receptors at lower environmental concentrations than for humans due to differences in stressor characteristics (e.g., type, intensity, duration, frequency, timing, scale, and mode and action).

In addition, the risk evaluation should include at least a qualitative assessment of uncertainty. Uncertainty can be examined in different ways. For example, uncertainty can be categorized in terms of parameter uncertainty, model uncertainty, decision-rule uncertainty, and variability *(Confronting uncertainty is risk management: A guide for decision-makers.* Finkel, A. 1990, Center for Risk Management, Resources for the Future, Washinghton, DC). An analysis of uncertainty can improve the quality of risk management actions, such as, establishing cleanup standards, selecting among identified remedial options, and communication with the public.

Page 5-l, para. l: More emphasis should be placed on the cumulative risk estimates, which were derived only from exposure pathways associated with groundwater. Pathways associated with other media (e.g., soil) were not considered here.

Page 5-1, para. 3: Apparently, iodine-129 and tritium were the only carcinogenic contaminants analyzed to determine cumulative cancer risk. It appears that arsenic for strontium-90 in the 200 Area may also contribute significantly to cumulative cancer risk, since these contaminants exceed MTCA Method B and MCL levels, respectively (see page 2-3). Arsenic concentrations exceed 1E-6 cancer risk, since carcinogen concentrations greater than MTCA Method B levels exceed a lE-6 cancer risk level. MCLs for carcinogens do not necessarily correspond to a fixed cancer risk level, since these standards also reflect treatment technology, quantification limits, and cost. In addition to tritium, iodine-129, arsenic, and strontium-90, nitrate may contribute to cancer risk as a result of in vivo conversion of nitrate to nitrosamines.

Page 5-1, para. 4: It is not clear whether or not nitrate is the only contaminant contributing significantly to non-cancer effects. For example, vanadium (and possibly arsenic) concentration exceeds the MTCA Method B level (see page 2-3). Noncarcinogen concentrations greater than MTCA Method B levels exceed a reference dose or hazard quotient of 1.0.

The statement on ecological risks infers that some type of ecological assessment was conducted on modeled contaminant concentrations at the river's edge. Clearly, there is no ecological risk assessment presented in this report. A screening ecological risk assessment should be performed since several pathways may expose biota to groundwater contaminants (e.g., uptake by vegetation, wildlife ingesting water from seeps and springs, etc)..

Page 5-1, para. 5: Plume migration is influenced not only by Kd, but also groundwater flow rate.

The unit risk factors (URFs) are derived, not only from the Hanford Site Risk Assessment Methodology (HSRAM), as stated, but also from a source in the literature containing radionuclude slope factors (e.g., EPA's Health Effects Assessment Summary Tables [HEAST]).

Page 5-2, para. 3: Use of a composite individual (i.e., 24 year exposure as an adult and 6 year exposure as a child) is a departure from HSRAM for groundwater pathways in the industrial and residental exposure scenarios. Departures should be explicitly stated.

Page 5-2, para. 4: Similarly, ingestion of shower water is not specified in HSRAM for either industrial or residential scenarios. Although these departures from HSRAM may be appropriate, they should be identified.

Page 5-2, para. 6: It is stated that unit concentrations of 1 mg/L (contaminant in groundwater) were used in calculations. The text should also state that unit concentrations of 1 pCi/L were used for radionuclides (presuming this is the case), since tritium and iodine-129 are among the contaminants of concern.

It should be clarified that URFs are summed across relevant groundwater pathways (e.g., ingestion, inhalation, dermal contact), so when URFs are multiplied by contaminant concentration, an estimate of risk is obtained for that contaminant for all pathways associated with groundwater.

Page 5-3, para. l: This paragraph makes no sense at all in the context of the report. These are values specified for the oral and inhalation slope factors and dermal permeability coefficient are those for chloroform. What is going on? Chloroform is not even one of the contaminants of concern in this analysis.

Page 5-3, para. 2: I presume the constant contaminant concentrations assumed over the chronic exposure duration are the average concentrations over the time period which take into account radioactive decay (e.g., tritium concentrations will be reduced considerable over 30 years). Clarify.

Page 5-3, para. 3:
It would be useful to present measured tritium and iodine-129 groundwater concentrations so the reader can better judge the uncertainty in the modeled isopleth data. This would reveal the spatial and temporal extent of the measured data so data extrapolations (i.e., modeled isopleth data) would be clearly viewed as such. One consequence of extrapolating groundwater concentration data, and therefore cancer risk data, is that the accuracy of the calculated cumulative cancer risk is largely overstated. An analysis of uncertainty would add perspective to this problem.

Page 5-3, para. 4: It would be useful to reference URFs (Table 5-l) and tritium and iodine-129 modeled concentration data (Figures 3-9 and 3-16) to support the statement that tritium initially contributes more significantly to cumulative cancer risk than does iodine-129.

Page 5-3, para. 6: The statement in this paragraph would be supported more clearly by linking cancer risk with concentrations via URFs. For example, if residential URFs (Table5-l) are multiplied by cleanup levels (Table 4-l), cancer risks of 2.5E-5 and 5.6E-6 are obtained from tritium and iodine-129. Cumulative cancer risks displayed in Figures 5-4 and 5-5 are predominantly below the summed cancer risk (3.1E-5) associated with these cleanup levels.

Page 5-3, para. 8: According to Figures 5-3 through 5-5 for residential scenarios, there are still groundwater areas exceeding 1E-5 cumulative cancer risk which corresponds to the MCTA Method B allowable site risk. Therefore, it may be appropriate to estimate risk for the recreational scenario as well. Furthermore, the residential scenario may not be the most conservative scenario considering possible exposure pathways characteristic of Native American inhabitants in the area (e.g., see Napier, BA et al. 1996. *Human scenarios for the screening assessment: Columbia River Comprehensive Impact Assessment.* DOE/RL-96-16-a).

Page 5-4, para. 2: Nitrate in groundwater was flagged as a contaminant of concern by hazard index screening (as stated), as well as, by aquatic biota toxicant screening according to the cited PNNL report (Napier et al. 1995. *Identification of contaminants of concern: Columbia River Comprehensive Impact Assessment.* PNL-10400, UC-630). The cited PNNL report also identifies strontium-90 and chromium as contaminants of concern in groundwater.

When converting radiation dose (mrem/year) to risk, it would be helpful to show the EPA radiation risk factor (3.9E-7 risk/mrem for fatal cancers). Also, it might be instructive for comparative purposes to multiply the calculated annual individual risk (1E-8/year) by a 70 year lifetime to estimate a lifetime cancer risk (7E-7).

Pages 5F-1 through 5F-5: In Figures 5-1 through 5-5, isopleths of risk are useful for visually displaying risk levels. However, isopleths give the illusion of greater accuracy than is warranted. Again, there should be discussion on the uncertainty associated with risk estimate, at least in a qualitative sense.

Page 5F-5: In the figure title, the year should read "2195," not "2129," for T=200 years.

Page 5T-1: URFs should have dimensions "risk per pCi/L." The manner in which URF units are presented in the table is confusing. Again, it should be clarified that pathway-specific URFs are summed across all relevant groundwater pathways to yield the industrial and residential URFs in the table (presuming this is the case).

I cannot reconcile URF values in the table with my own calculations. Therefore, it would be helpful to show calculations for deriving URFs. What is the literature source of radionuclide slope factors? For example, EPA's HEAST (May 1995) lists an ingestion slope factor for tritium of 7.15E-14 risk/pCi. The URF for tritium for ingesting groundwater in the industrial scenario would be calculated as follows:

URF=(7.15E-14 risk/pCi) (1 L/day) (250 days/year) (20 year) = 3.58E-10 risk per pCi/L

This calculated URF is only for one pathway (i.e., groundwater ingestion), yet it exceeds the corresponding industrial URF for tritium listed in the table (2.71E-10), which presumably accounts for all groundwater pathways. An analogous situation exists for the residential URF for tritium. Please clarify these discrepancies.

Why is a footnote for "TCE" included? There is no TCE in the table.

Why are "Source" and "Remediation Scenario" included in the table? What purpose does this information serve, especially when it is labeled "N/A?"

Page 5T - 2: Although the listed pathways appear appropriate, Table 5-2 should note departures from HSRAM. For example, shower water ingestion is not specified in HSRAM for either industrial or residential scenarios. For radionuclides in particular (e.g., tritium, iodine-129), shower dermal absorption is not specified in HSRAM.

Page 5T-3: In general, information presented in Table 5-3 is helpful in understanding the analysis. The table title should specify that these exposure parameters are associated with groundwater pathways in this application. Note that body weight and averaging time apply only to nonradioactive contaminants, and are not used in the calculation of radionuclide intakes. It should be clarified here, that fruit and vegetables consumed are irrigated with groundwater.

Several other clarifications should be added, primarily relating to compatibility with HSRAM. For chemical noncarcinogens (e.g., nitrate), HSRAM specifies goundwater ingestion as 1 L/day for a 16 kg child over a six year exposure duration in the residential scenario. Shower frequency, shower duration, and skin area are specified in HSRAM only for nonradioactive contaminants. Shower water ingestion is not specified in HSRAM for either industrial or residential scenarios. The indoor air volatilization factor for radionuclides specified by HSRAM is the water volatilization factor for radon (0.1 L/m3). This value should be described and added to the table.

Page 5F-5, Figure 5-5: The countering must be labeled wrong on this figure. See the two contours labeled lE-5.

Page 5T-l, Table 5.l: Justify and explain why only carcinogenic risk are considered.

Page 6-2, Bullet 2: The idea about pumping the high concentration portions of the plumes should be further explored in a true CMS fashion. More effort needs to be put into the analysis of this option.

The benefits should be analyzed and the cost should be defined. Simply stating, "it may be a viable option" and then stating, "the cost may be prohibitive" is not sufficient analysis.

Page6-ll, number 2 indent: Alternative 2 - Institutional Controls, must include controlled access to springs to protect people and wildlife. It must also include RCRA groundwater monitoring for the RPP unit.

Page 7-l, Section 7.2.2: Alternative 2 - Institutional Controls, must include controlled access to springs to protect people and wildlife. It must also include RCRA groundwater monitoring for RPP unit.

Page A-5, para. l: Please delete the words "mini CERCLA statue."

Please add, "which applies to 200-PO-l operable unit" to the last sentence in the first paragraph.

Sections 4 and 5 of Appendix A: These sections are inadequate and a meeting should be scheduled with the contractor, USDOE and Ecology to work through a path forward on these sections. Specific problems include:

- No monitoring of high concentration areas is included,
- and no protection monitoring is provided for the 400 Area supply wells located Richland.